

REMARKS

Claims 1-11, 13-23, 25, 26, 42-44 and 47 are now in this Application, and are presented for the Examiner's consideration.

Finality of Rejection

It is submitted that the Office Action mailed June 30, 2004 should have been made non-final, and it is requested that the finality of the Office Action be removed.

MPEP 706.07(b) permits finality of a first Office Action in a continuing application where all of the claims of the continuing application are drawn to the same invention claimed in the earlier application.

Applicant amended claim 1 to add the limitation of "each said housing including an inner cylindrical space defined by a first outer radius and a surrounding annular packing space defined between a first inner radius equal to said first outer radius and a second outer radius greater than said first outer radius." Since this limitation was not present in the claims in the original application, a different claimed invention was presented from the claims in the original application.

Applicant attempted to advance prosecution by adding limitations to the claims to distinguish from the prior art of record.

It is therefore submitted that the finality of the Office Action should be removed.

Prior Art Rejections

Claims 1-4, 6, 10-12, 19, 21, 25, 43 and 47 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,524,481 to Zha et al.

In order to better distinguish from Zha et al, claim 1 has been amended to recite the following distinctive aspects of the present invention:

- a) a volumetric ratio of all the hollow fiber membranes 33 arranged in the packing

space 18 to the packing space 18 inside the module is less than 10%;

- b) at least one segmentation element 5 fitted on a surface of the housing and extending into the packing space 18 in a generally radial direction of the housing for separating at least two hollow fiber membrane bundles 17 from one another;
- c) each segmentation element 5 having at least one opening therein through which liquid can travel; and
- d) the housing having an outer structure providing at least one open area therein through which liquid can travel.

As recited in paragraph [0036] of the present application: "The feed solution can flow turbulently over the individual hollow fiber membranes inside the module owing to the low packing density of the hollow fiber modules according to the invention inside the module, to the use of segmentation elements according to the invention with very large passage surfaces in preferred embodiments, and to the use of a module housing with very large openings." As to the openings, paragraph [0043] of the present application states: "So that it is also possible for sufficient liquid to flow from the surroundings through the first and/or second housing into the housing interior, the lateral surface of the housing cylinder is preferably provided with sufficiently large openings."

By reason of this structure, there is a turbulent flow over the fibers. This turbulent flow functions to dislodge fouling materials from the membranes without the need for any gas bubbles, as in Zha et al.

On page 3 of the Office Action, the Examiner states, as to Zha et al, "at least two fiber bundles are separated by a segmentation element fitted on the lateral surface of the housing as in instant claim 12 (see fig 9, 10). The length of at least one segmentation element corresponds to the length of the housing as in instant claim 19 (figures, col 8 lines 20-27). Segmentation elements are as long as the pottings provided at the ends, and the pottings are segmented as in

instant claim 21 (fig 9)."

However, applicants respectfully disagree with this conclusion. Zha et al does not provide any segmentation elements. Figs. 9 and 10 of Zha et al merely show fiber membrane bundles 46 mounted in and extending between an upper 47 and lower potting head 48. All of the fiber bundles 46 are surrounded by an outer screen 51 to prevent excessive movement between the fibers. The fiber membranes 53 are potted in bundles 46 to form a partitioned arrangement having spaces 54 extending transverse of the fibre bundles.

Thus, Zha et al merely secures the opposite ends of the fiber membrane bundles 46 into the upper and lower potting heads 47, 48, with spaces 54 between the bundles 46. There are no structural elements between the bundles 46 at all, and therefore, there is no disclosure or any remote suggestion of any segmentation element with an opening therein, fitted on a surface of the housing and extending into the packing space in a generally radial direction of the housing for separating at least two said hollow fiber membrane bundles from one another, as now claimed.

It is clear that Zha et al could not prevent fouling of the membranes merely by the arrangement of Figs. 9 and 10 thereof. Throughout the Zha et al patent, there is a discussion of using gas bubbles. It is these gas bubbles that produce this end result.

Accordingly, by providing a low packing density, the claimed segmentation elements and openings in the housing outer structure, turbulent flow can be formed with the present invention which prevents fouling of the membranes, eliminating the requirement for gas bubbles in Zha et al. Therefore, no additional cleaning procedures, such as providing air bubbles, are required by the present claimed invention.

Accordingly, it is respectfully submitted that the rejection of claims 1-4, 6, 10-12, 19, 21, 25, 43 and 47 under 35 U.S.C. §102(e), has been overcome.

Claim 11 was rejected under 35 U.S.C. §102(e) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as being obvious from, U.S. Patent No. 6,524,481 to Zha et al.

The remarks made above in regard to Zha et al are incorporated herein, and are therefore not repeated.

Accordingly, for the same reasons given above, and since claim 11 depends from claim 1, it is respectfully submitted that the rejection of claim 11 under 35 U.S.C. §102(e) or 35 U.S.C. §103(a), has been overcome.

Claim 5 was rejected under 35 U.S.C. §103(a) as being obvious from U.S. Patent No. 6,524,481 to Zha et al.

The remarks made above in regard to Zha et al are incorporated herein, and are therefore not repeated.

Accordingly, for the same reasons given above, and since claim 5 depends from claim 1, it is respectfully submitted that the rejection of claim 51 under 35 U.S.C. §103(a), has been overcome.

Claims 13-16, 20, 22 and 23 were rejected under 35 U.S.C. §103(a) as being obvious from U.S. Patent No. 6,524,481 to Zha et al in view of U.S. Patent No. 5,282,964 to Young et al.

The remarks made above in regard to Zha et al are incorporated herein, and are therefore not repeated.

Young et al was cited for disclosing hollow bundles 31 in a housing which are separated by segmentation elements 30.

However, Young et al is deficient in two respects. First, Young et al does not provide for a low packing density, which is necessary in order to provide for sufficient liquid flow therearound

in order to obtain the turbulent flow that prevents fouling of the membranes.

Second, the segmentation elements 30 of Young et al are impermeable. See column 10, lines 63-64. This means that liquid cannot travel through the segmentation elements, whereby turbulent flow cannot be obtained.

Therefore, the most that would be provided with this combination is that the impermeable elements 30 of Young et al would be added to separate the bundles of Zha et al. However, this would not permit the free flow of liquid, while also separating the bundles, and as a result, there would be no turbulent flow. This means that the air bubbles of Zha et al would still be required to prevent fouling of the membranes.

In this regard, in addition to claim 1 reciting the low packing density, claim 1 also recites that each segmentation element has at least one opening therein through which liquid can travel, contrary to the teachings of Young et al.

Claim 13 further defines the segmentation element as having a frame part having at least one said opening therein which defines a free passage surface surrounded by the frame part. This is shown, for example, by Figs. 1b and 1c of the present application. Because the elements 30 of Young et al are impermeable, there would be no such openings, contrary to the clear recitation in claim 13.

The Examiner states that it would be an obvious modification to make the segmentation elements 30 of Young et al to have a lattice type structure, as with the lattice type screen of Zha et al. In the first place, as discussed above, Zha et al does not disclose or even remotely suggest any segmentation elements whatsoever. In the second place, the screen 9, 51 of Zha et al is only provided to prevent excessive movement between the fibers (see column 8, lines 17-19 of Zha et al). More importantly, the screen 9, 51 of Zha et al merely corresponds to the claimed outer structure in claim 1. This permits liquid to flow through the lateral or outer wall of the housing. This is very different from providing segmentation elements within this outer wall

structure having openings therein. There is no suggestion in the art or any logical reasoning for providing any segmentation elements at all in Zha et al, let alone for making the impermeable segmentation elements 30 of Young et al into a lattice structure in view of completely different outer wall structure in Zha et al.

Third, making this modification to the impermeable segmentation elements of Young et al would make Young et al inoperative for its intended purpose. Young et al states at column 3, lines 18-22: "each bundle being contained within a separate and distinct enclosure substantially impermeable to the fluids being separated and arranged together for substantially parallel flow of a feed fluid mixture through each bundle." This language is also provided in claim 1 of Young et al, thereby indicating that it is an important aspect of Young et al.

If the segmentation elements 30 of Young et al were made permeable or with the lattice structure at the outer wall of Zha et al, each bundle would not be contained within a separate and distinct enclosure substantially impermeable to the fluids ..., thereby destroying the operability of Young et al.

As discussed above, turbulent flow is permitted by providing the at least one opening in each segmentation element. Accordingly, it is respectfully submitted that the rejection of claims 13-16, 20 and 22-24 under 35 U.S.C. §103(a), has been overcome.

Claims 7-9, 26 and 42 were rejected under 35 U.S.C. §103(a) as being obvious from U.S. Patent No. 6,524,481 to Zha et al in view of European Patent Publication No. 1 008 358.

The remarks made above in regard to Zha et al are incorporated herein, and are therefore not repeated.

The European patent publication fails to cure the deficiencies of Zha et al, and is therefore deficient for this reason.

First, the European patent publication is silent as to packing density.

More importantly, the European patent publication provides only a single bundle of fibers. Thus, there is no disclosure or a remote suggestion of any segmentation elements whatsoever. There is also no disclosure or even a remote suggestion of any open areas in the outer structure, whereby turbulent flow can be achieved.

Accordingly, it is respectfully submitted that the rejection of claims 7-9, 26 and 42 under 35 U.S.C. §103(a), has been overcome.

Claims 17, 18 and 44 were rejected under 35 U.S.C. §103(a) as being obvious from U.S. Patent No. 6,524,481 to Zha et al in view of U.S. Patent No. 5,282,964 to Young et al, as applied to claim 12 above, and further in view of U.S. Patent No. 4,689,255 to Smoot et al.

The remarks made above in regard to Zha et al and Young et al are incorporated herein, and are therefore not repeated.

Smoot et al fails to cure the deficiencies of Zha et al and Young et al, and is therefore deficient for this reason.

First, Smoot et al is silent as to packing density.

In Smoot et al, there is a layer 1 on which are provided bundles 7 of fibers 2, with no segmentation elements between the bundles 7. A layer 6 is placed on top of the bundles 7, parallel to layer 1. See Fig. 2. Then, as shown in Fig. 3, layer 6 is wrapped about a centrally located distributor tube 12, and the entire assembly of Fig. 2 is then wound in a spiral manner therearound.

Since there is no segmentation element fitted on a surface of the housing and extending into the packing space in a generally radial direction of the housing for separating at least two said hollow fiber membrane bundles from one another, Smoot et al fails to cure this deficiency of the other cited references as well.

Accordingly, it is respectfully submitted that the rejection of claims 17, 18 and 44 under 35 U.S.C. §103(a), has been overcome.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

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The Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-2525.

In view of the foregoing amendments and remarks, it is respectfully submitted that Claims 1-11, 13-23, 25, 26, 42-44 and 47 are allowable, and early and favorable consideration thereof is solicited.

Respectfully submitted,



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